

Nanostructured Super-Black Optical Materials, Phase I

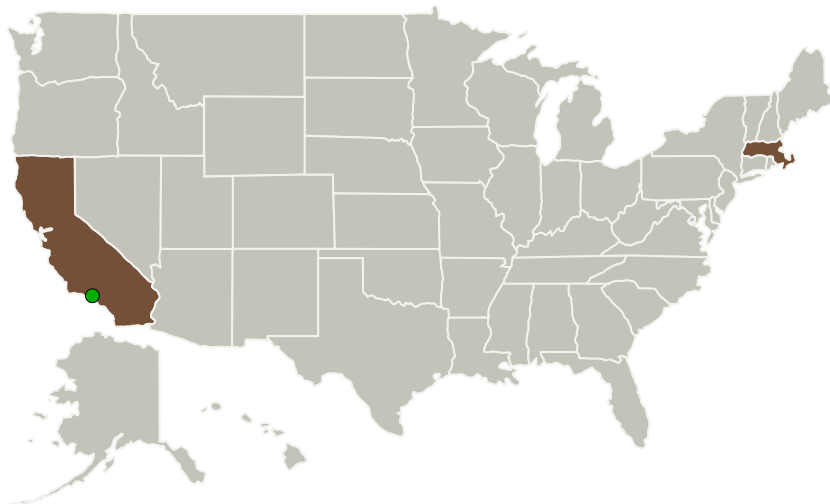
Completed Technology Project (2012 - 2012)



Project Introduction

NASA faces difficulties in imaging and characterizing faint astrophysical objects within the glare of brighter stellar sources. Achieving a very low background requires control of both scattered and diffracted light. Aligned arrays of carbon nanotubes have recently been recognized as having world-leading optical absorption, far above competing state of the art materials. The GSFC team noted that nanotube arrays have the "potential to provide order-of-magnitude improvement over current surface treatments and a resulting factor of 10,000 reduction in stray light when applied to an entire optical train." While excellent performers, NanoLab recognizes that the nuances of the array structure, such as angular alignment, diameter, length, and top-surface roughness of the array play a major role in their optical properties, and these need to be characterized if we wish to control and tailor these materials for specific applications. Further, the arrays grown to date are often poorly adhered to their substrates, which are typically silicon. NanoLab plans to develop processes grow arrays on flexible, tougher substrates such as Ti and stainless steel foils, so they can be formed and inserted into optical systems without damage. We will correlate the VIS-IR optical properties to the array structure and to the process parameters that generate them. Ball Aerospace will assist NanoLab in this effort with BRDF and other optical measurements.

Primary U.S. Work Locations and Key Partners



Nanostructured Super-Black Optical Materials, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Nanostructured Super-Black Optical Materials, Phase I

Completed Technology Project (2012 - 2012)



Organizations Performing Work	Role	Type	Location
Nanolab, Inc	Lead Organization	Industry	Waltham, Massachusetts
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

**February 2012:** Project Start**August 2012:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140329>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanolab, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

David L Carnahan

Co-Investigator:

David Carnahan

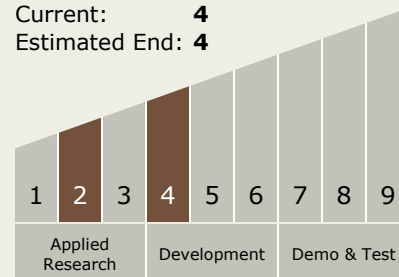
Nanostructured Super-Black Optical Materials, Phase I

Completed Technology Project (2012 - 2012)



Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.1 Optical Communications
 - └ TX05.1.6 Optometrics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System